

# Notice of Allowability

Application No.

10/622,132

Examiner

Matt Luby

Applicant(s)

SEGAWA, TORU

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS. This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed February 7, 2005.
2. ☒ The allowed claim(s) is/are 1-29 and 31-39.
3. ☒ The drawings filed on 17 July 2003 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☒ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

### EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In claim 39, line 10 the word "warm" has been changed to --worm--.

2. The following is an examiner's statement of reasons for allowance:

a) The prior art fails to disclose an EPS (electric power steering) assist device having first to fourth bearings, the first bearing supports the end section of the rotating shaft on the opposite side of the worm shaft inside the casing; the second bearing supports the portion between the joint, which connects the worm shaft and the rotating shaft, and the rotor inside the casing; the third bearing supports the end of the worm shaft on the side of the rotating shaft inside the gear housing such that the worm shaft can free tilt within a specified range and the fourth bearing supports the end of the worm shaft on the opposite side from the rotating shaft inside the gear housing, wherein a clearance in the radial direction is provided between either the outer peripheral surface of the worm shaft, wherein an elastic-force application means comprises an elastic member having a variable spring constant that can be changed from a low spring constant of 1 N/mm to 20 N/mm to a high spring constant of 180 N/mm or more, and located between the fourth bearing and gear housing, between the fourth bearing and

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the worm shaft and/or between the gear housing and the worm shaft so as to apply an elastic force corresponding to the radial displacement of the worm shaft, wherein when not driven by the electric motor, the elastic force having a low spring constant applies a pre-load to parts of the toothed surfaces of the worm and worm wheel to bring them into contact; and when driven by the maximum output of the electric motor and the worm shaft is moved in the direction going away from the worm wheel by the reaction force applied to the worm shaft from the worm wheel, with the area of meshing moved just 0.1 mm to 1.0 mm in the radial direction of the worm shaft with respect to when not driven, the elastic force having a high spring constant applies a pre-load to parts of the toothed surfaces of the worm and worm wheel and brings them into contact, wherein the amount of increase in torque of the assist shaft due to the rise in friction force in the area where the worm shaft meshes with the worm wheel caused by applying an elastic force having a low spring constant to the worm shaft is kept within a range of 0.4 Nm to 5 Nm.

b) The prior art fails to disclose an EPS assist device wherein the first bearing supports the end of the rotating shaft on the side opposite from the worm shaft inside the casing such that the rotating shaft can tilt freely within a specified range; and the fourth bearing supports the end of the worm shaft on the opposite side from the rotating shaft inside the gear housing; wherein a clearance in the radial direction is provided either between the outer peripheral surface of the outer race of the fourth bearing and the inner surface of the casing, or between the inner peripheral surface of the inner race

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of the fourth bearing and the outer peripheral surface of the worm shaft or in the interior of the fourth bearing.

c) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing, and a torsion coil spring that is located around the pre-load pad, and wherein the pre-load pad is made of a synthetic resin.

d) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and a torsion coil spring is located around the pre-load pad, and wherein there is a cap in an axial direction between a surface of wires of each winding of the torsion coil spring.

e) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and a torsion coil spring is located around the pre-load pad, and wherein an arm section is formed on part of the pre-load pad for controlling a displacement of the pre-load pad inside a gear housing before the worm shaft is inserted through a through hole that is formed in the pre-load pad.

f) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and a torsion coil spring is

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located around the pre-load pad, and wherein an area of contact between an outer peripheral surface of the pre-load pad and the torsion coil spring is arc shaped such that a radius of curvature of a part on the outer peripheral surface of the pre-load pad away from the area of contact is less than the radius of curvature of the area of contact.

g) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and a torsion coil spring is located around the pre-load pad, and wherein a protruding fitting section is formed on a part of an outer-peripheral surface of the pre-load pad for preventing the torsion coil spring from falling off from around the pre-load pad.

h) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and wherein protrusions are formed at two or more locations on each end in an axial direction of the pre-load pad for controlling displacement in the axial direction of the pre-load pad inside the gear housing.

i) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and wherein an elastic material is located between the gear housing or a member fixed to the gear housing and an outer peripheral surface of the pre-load pad for preventing the pre-load pad from turning inside the gear housing.

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j) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and wherein a through hole is formed in a part of the pre-load pad for inserting a tip end of the worm shaft and a tapered surface is formed on the part of the pre-load pad for guiding part of the worm shaft into the through hole.

k) The prior art fails to disclose an EPS wherein an elastic-force application means is a pre-load pad that is located inside a gear housing and wherein a tapered surface is formed on a part of the pre-load pad or bearing for guiding the worm shaft inside the pre-load pad or worm shaft, and wherein a diameter of an opening of the tapered surface is greater than a diameter of the part on the worm shaft that is inserted into the opening by 0.5 mm or more.

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Japan on February 20, 2003. It is noted, however, that applicant has not filed a certified copy of the Japanese application as required by 35 U.S.C. 119(b).

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5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matt Luby whose telephone number is (571) 272-6648.

The examiner can normally be reached on Monday-Friday, 9:30 a.m. to 6:00 p.m..

6. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lesley Morris can be reached on (571) 272-6612. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

7. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matt Luby  
Examiner  
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M.I.  
March 17, 2005